Space Weather Forecast

Issued on Tuesday, 26 December 2023 at 01:30 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Numerous CMEs observed: Chance Minor Geomagnetic Storm G1 periods, with a Slight Chance of G2 Moderate Storm from the 27 December. Chance of Moderate-class X-ray flares throughout.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Low over the past 24 hours, with only minor Common-class flares observed. There are currently eight sunspot regions on the visible disc. The largest sunspot is located in the southwest quadrant, which has the highest probability of producing any significant flaring, although has been relatively inactive in the past 24 hours. The remaining seven sunspot regions appear to be stable or in decay. There has been numerous CME (Coronal Mass Ejections) observed in the past 24 hours. The most noteworthy events are summarised as:

Firstly, a large 'filament eruption' from the northwest around 24/1200UTC. This has been analysed extensively, and although it largely passes above the plane of the Earth's orbit, a glancing blow is considered possible from around the middle of the UTC day of 27 December.

Secondly, a high 'coronal dimming' visible on extreme UV imagery from the southwest around 24/1430UTC. This feature has been analysed as crossing mainly below and ahead of the Sun-Earth line around the turn of the UTC day 27 into 28 December, but again a glancing blow is considered possible.

Thirdly, a high coronal dimming around 25/0700UTC occurred near the middle of the Sun. This was not tied to any filament as such, but a CME appears to have been released. Provisionally, this is likely the most directly-aligned of any of the candidate CMEs with Earth, and early satellite imagery suggests a CME with an Earth-bound trajectory, at least in part. This has been analysed and is considered to be Earth-directed, with a likely arrival on 28 December - possibly combining with the second CME mentioned above.

Solar Wind / Geomagnetic Activity: Solar winds were slightly elevated throughout the period, ranging between 415 to 480km/s. The magnetic field and the all-important north-south component was weak throughout. The net result of the above solar wind measures was for Quiet (Kp 0-1) geomagnetic activity throughout the period.

Energetic Particles / Solar Radiation: No solar radiation storms were observed despite the recent Moderate-class flare activity.

Four-Day Space Weather Forecast Summary

Solar Activity: Low to moderate activity is forecast, with an ongoing chance of isolated Moderate-class X-ray flares.

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Met Office Space Weather Forecast

Solar Wind / Geomagnetic Activity: There has been a glut of CMEs in the past 24 hours, and there is now high uncertainty in the phasing of impacts from the 27 December (Day 2). At least two, possibly three, have Earth-directed components, for a full discussion please see the geomagnetic activity section.

Mainly quiet geomagnetic conditions should give way to a chance of Minor Geomagnetic Storm G1 periods on and after Wednesday 27 December as a result of CME influence, with Slight Chance of a G2 Moderate Storm. No coronal hole fast winds feature in the forecast.

Energetic Particles / Solar Radiation: There is a daily slight chance of minor solar radiation storms given any further notable flares from the southwestern sunspot region or other regions on the facing side, especially as these move into the western solar hemisphere.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	40	60	40
Strong	G3	No	1	1	5	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	30	30	30	30
Very Active	R3 to R5 X	No	5	5	5	5

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Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	5	5	5	5
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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